HOW TO MEASURE EGG I.Q.

(INTERIOR QUALITY)

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INTRODUCTION

Wholesale egg handlers have been reporting the last few years that the percentage of top-quality eggs is gradually decreasing. This claim is made in spite of improvements in handling facilities, such as refrigeration and packaging.

The interior quality (I.Q.) of the eggs from a large number of hens of various breeds and strains was determined recently. The workers found a wide difference in the I. Q. of new-laid eggs. The variation was not a question of feed, climate, breed, or handling. Certain individual hens persistently laid eggs of low interior quality. Other hens consistently laid eggs of higher quality.

To improve the new-laid egg it is necessary to improve the hen. Breeders have made great progress in getting the hen to lay more eggs. It remains for them to improve the original quality of the egg itself.

Breeding experiments have demonstrated that egg quality is determined to a large extent by inheritance. Therefore, a simple means of identifying and eliminating low quality producers will make it possible to improve the quality of new-laid eggs.

Commercially, egg quality is determined by holding the egg before a strong light and examining it in the penetrating rays. The process is known as candling. Candling is reasonably accurate and egg grades are based on this method of determining quality.

In some ways, however, candling eggs is like culling hens. You can do a pretty good job of separating the high-producing layers from the poor ones by culling. But, if you want to know exactly how many eggs an individual bird will lay you must use a trapnest. Likewise, candling will separate eggs into rather wide classes of quality, but more accurate and detailed information on egg quality can be obtained by breaking out the egg on a flat surface and studying and measuring its parts.

Many methods of scoring egg quality have been developed. Some of these are time-consuming and require expensive equipment. The methods described in this publication appear to be the simplest, fastest, and most accurate.

HOW TO DETERMINE EGG I. Q.

The main factors that determine the quality of a fresh egg are albumen quality, freedom from defects, and shell quality.

There are two general ways of determining the albumen quality of a broken-out egg. One is to judge the quality by comparison with a set of graded pictures. The egg is given the score of the picture it most nearly matches. This is called the eye-scoring method.

Another method is to measure the height of the white and convert this to an index number. This is accomplished by using a formula devised by a research worker named Haugh.[1] The resulting figure is the quality value in Haugh units.

EYE SCORING METHOD

To give an egg a quality score, break it onto a flat surface such as a piece of window glass. Compare this egg with a set of pictures and select the number, or score, of the egg it most nearly matches. Be sure to make comparisons for both the top and the side view of each egg. There are two different sets of pictures, or charts, that can be used for scoring by this method.

The U. S. Department of Agriculture chart.--This chart shows eggs in full size and in natural colors. Scoring is easier when the pictures are in color and show eggs the same size as the one you break out. Figure 1 is a small copy of this chart. It shows 12 eggs, 3 being used for each of the 4 qualities, U. S. AA, A, B, and C.

High, average, and low grades are represented within each quality, as they are usually found in market channels. The yolks stand up high in the better eggs and are flat and weak in the eggs of low quality. Fresh eggs do not have flat yolks, even if they are of low quality. This chart is available from the Marketing Services Division, Poultry Branch, Production and Marketing Administration, U. S. Department of Agriculture, Washington 25, D. C.

The Van Wagenen chart.--This chart, sometimes called the Cornell chart (figure 2), has been widely used for eye scoring of egg quality. The chart shows nine eggs that are of high, medium, and low quality, as they would appear the day they are laid. The eggs are actually less than 4 hours old. All the yolks stand up high even when the albumen quality is poor. This chart is in black and white and the pictures are slightly less than half the size of an ordinary egg. It is available through purchase from the Service Press, Inc., Hartford, Conn.[2]

[1]Haugh, R. R., The Haugh unit for measuring egg quality. U. S. Egg and Poultry Magazine. Vol. 43, page 552, 1937.

[2]Listing this name and other names and devices does not constitute endorsement, nor does omission imply discrimination.

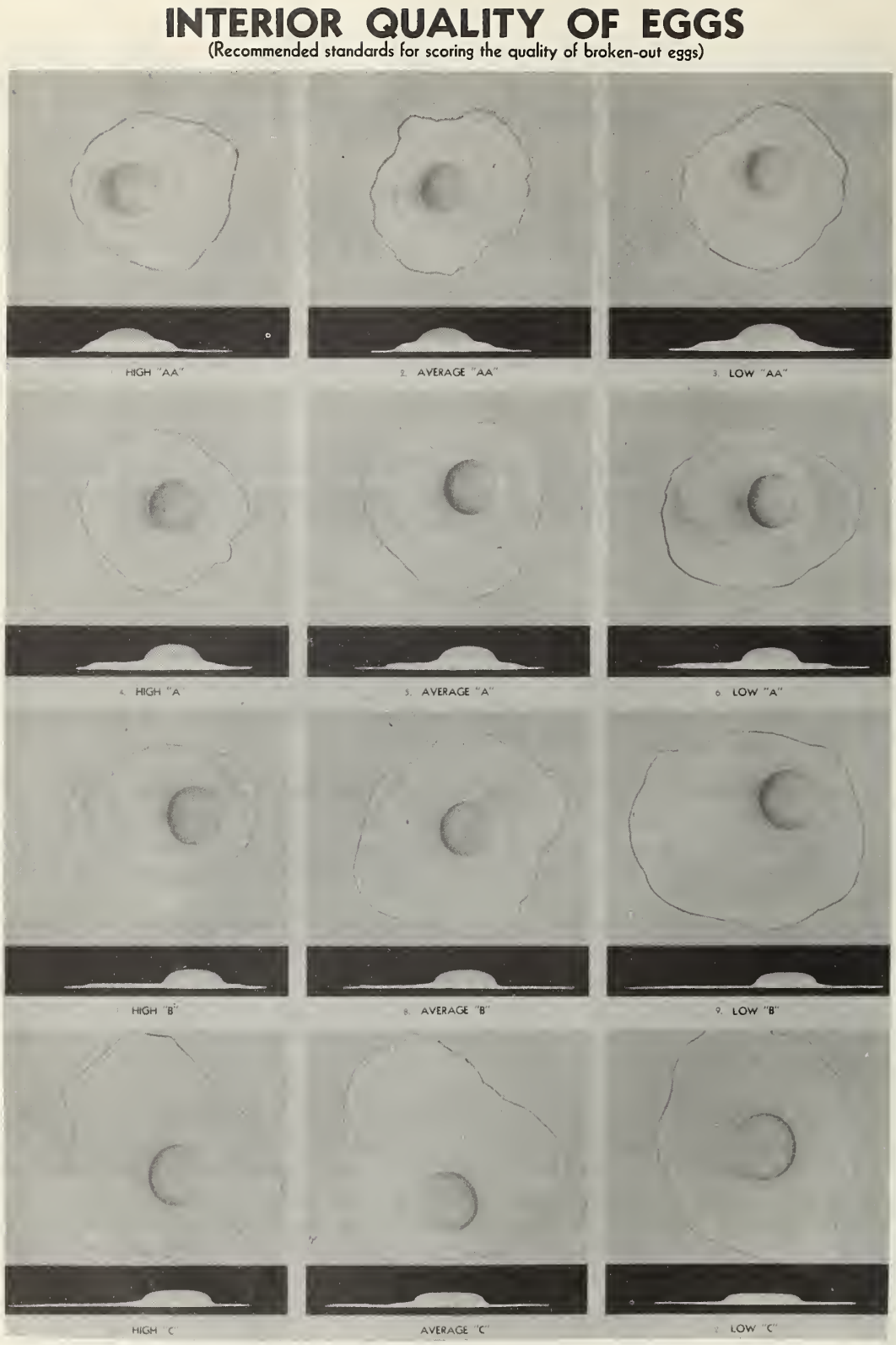


Figure 1.--Black-and-white reproduction of U. S. Department of Agriculture color chart showing eggs by grades of interior quality specified in U. S. standards of quality.

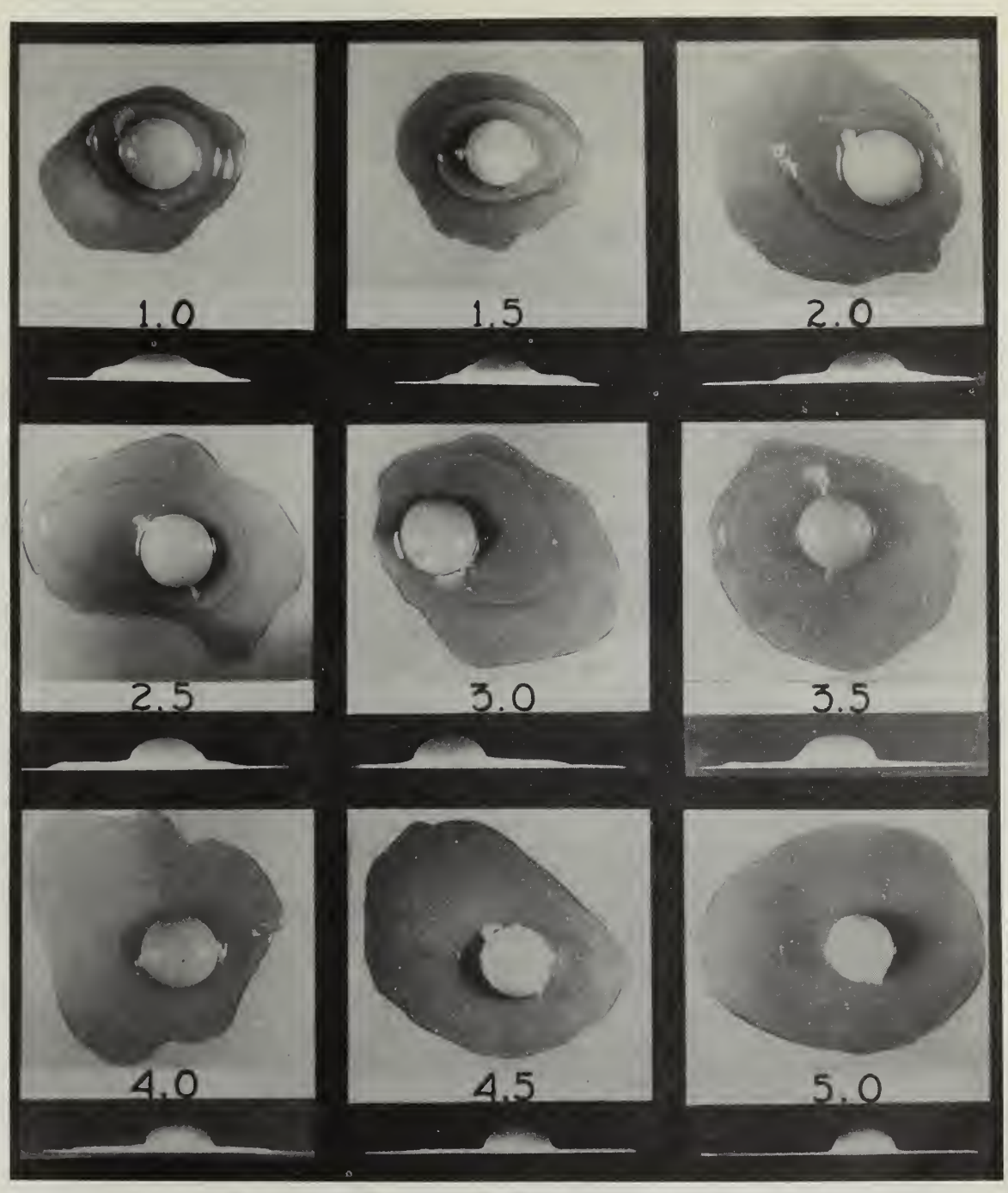


Figure 2.--The "Van Wagenen" or "Cornell" chart showing fresh eggs of high quality in the top row, medium quality in the middle row, and low quality in the bottom row.

Which chart should you use? It makes no difference. Egg quality can be scored adequately with either chart. However, many people already possess one or both of these charts so it is necessary to discuss both of them. Once you have started using one of the charts it is not advisable to shift to the other. Inconsistencies in scoring may occur and valuable data will be lost.

THE "HAUGH UNIT" METHOD

In order to have a desirable appearance (high quality) when broken-out, an egg must have a thick white that is firm and stands up high around the yolk. Of course, the yolk must be firm and round also. The yolks of new-laid eggs, however, are never flat and weak, but the thick white may be weak and watery and spread out widely around the yolk (see figure 2). As the egg grows older the yolk will eventually flatten but so does the thick white. Because this is true the height of the thick white is a very reliable index of the over-all quality of an egg when there are no defects.

However, the height of the thick white does not vary in direct proportion to quality. In addition, the height of the thick white is influenced by the size of the egg. A convenient means of overcoming these difficulties is to calculate the Haugh unit of quality. Differences in egg size are corrected, and between each grade, AA, A, B, and C, there are exactly the same number of Haugh units.

The steps in determining Haugh units are as follows:

1. Weigh the egg.
2. Break it out on a flat surface such as a piece of window glass.
3. Measure the height of the thick white using a micrometer or height gage (figure 3)[3].

Select an area where the thick white is flat on top. A good place to measure is halfway between the yolk and the edge of thick white. Do not measure on top of a chalaza or a bubble. Only one measurement is taken. After reading the albumen height on the micrometer determine the Haugh units on a calculator[4] (figure 4). Instructions on using the calculator are included with each instrument.

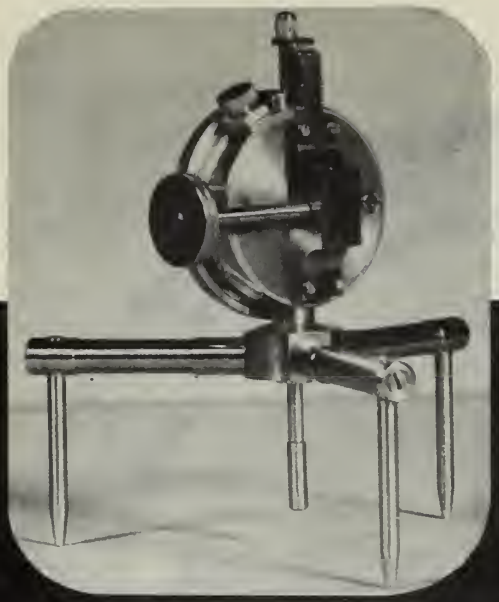
A high Haugh unit value means high quality. The eggs pictured in figure 1 are arranged on the basis of their Haugh unit values. Eggs measuring above 79 Haugh units are U. S. AA quality. U. S. A quality ranges from 55 to 78, U. S. B quality 31 to 54, and values lower than 31 are U. S. C quality.

FREEDOM FROM DEFECTS

The most common defects found in eggs are blood and meat spots. These are readily seen when the broken-out egg is examined. The size and number of such spots should be recorded. The U. S. standards for quality of individual shell eggs designates spots over 1/8 inch in diameter as large and those less as small. Yolks are sometimes classified as normal, spotted, or curdled.

[3]Available from Robert Rector, 700 Montgomery Ave., Laurel, Md.

[4]Available from Marketing Services Division, Poultry Branch, Production and Marketing Administration, U. S. Department of Agriculture, Washington 25, D. C.



Rear view of micrometer showing construction details.

Figure 3.--The micrometer or height gage for measuring the height of the thick white. Gage shown here in position over an egg.

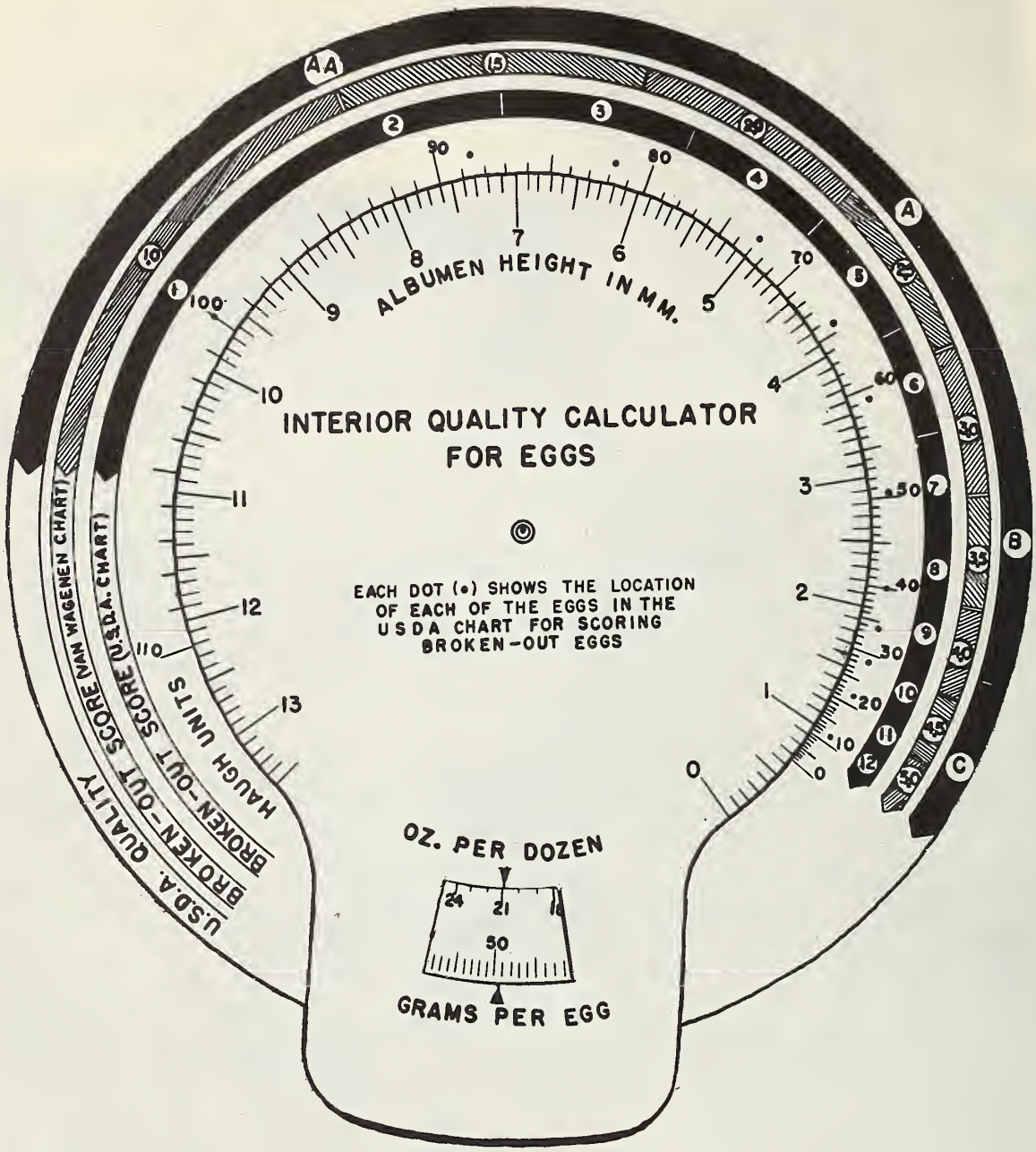


Figure 4.--The interior quality calculator for eggs. The Haugh units are calculated from albumen height and egg weight. It also shows the relationship of Haugh units to USDA scores, Van Wagenen scores, and USDA qualities.

MEASURING SHELL QUALITY

The hen is expected to build an egg shell strong enough to carry its contents to the consumer without cracking under normal handling conditions. One easy method of estimating strength is to measure the thickness of the shell. Figure 5 shows a thickness gage[5] that does the job satisfactorily with a little modification. These gages were designed to measure the thickness of paper; therefore, the jaws are flat. Since egg shells are not flat it is necessary to remove the flanged tip from the upper jaw and round it off with a file or on an emery wheel. When measuring egg shells always place the rounded jaw on the *inner* surface of the shell.

Remove a piece of shell, place it between the jaws of the gage, and read the figures on the scale. This measurement requires only a few seconds. Use samples of shell from different parts of the egg to locate the thinnest section. Many times this will be either the large or small end. If the measurements from the ends and center sections of the shell are the same you will find it easier to use only the center portion. It is usually easier to leave the shell membranes on the piece of shell when measuring. In testing the shells from a certain hen be sure to take the piece of shell from about the same area each time. Shells thinner than 13 thousandths of an inch (0.34mm) are poor risks in market channels. Shell defects such as wrinkles, ridges, rough areas, and body checks should be recorded along with shell thickness.

FACTORS TO CONSIDER IN TESTING EGGS

Number of eggs to measure. In determining albumen quality, it has been found that testing eggs from a hen until two eggs are found that agree in score or Haugh units gives a good estimate of the performance of that bird. Any two eggs measuring within 8 Haugh units of each other are considered to be in good agreement. Individual birds are usually very consistent from egg to egg and in 85 to 90 percent of the tries, the first two eggs from a hen will agree. With other birds it may be necessary to break a third or fourth egg to find two that agree. The average will be about 2-1/4 eggs per bird in the flock.

For blood and meat spots, and shell thickness, more than two eggs would probably give a better index of the bird's performance. However, the two or three eggs used for testing albumen quality will serve as a guide.

When to measure. In spring-hatched birds, albumen and shell quality are at the lowest in July and August. The most critical test can be made during those months. Birds should be in production at least 4 months before quality determinations are made. Nearly all pullets when first in production lay eggs of high quality.

Time required to test eggs. After some practice, a fairly good operator can measure the Haugh units, measure the shell thickness, and record the blood and meat spots of 30 or 40 eggs an hour. If the operator is using the "eye scoring" method he may be able to do as many as 60 or 70 an hour. The operation is much more rapid when done by two operators, one to break eggs and score or measure, and the other to record the data.

[5]Paper thickness gage manufactured by B. C. Ames Co., Waltham, Mass. Any one of four models will serve. Model Nos. 25, 251, 252, or 25M.

Figure 5.--Paper thickness gage for measuring shell thickness.

A practical method is to save enough eggs each day to break out the next day in 2 or 3 hours. In that way quality measurements can be worked into a busy schedule.

Keeping records. Recording these factors will entail additional work and should not be overlooked in planning a program.

Cost. The height gage for measuring thick white costs around $50.00; the Haugh unit calculator, about $3.00; the shell-thickness gage, around $20.00. For scoring, the USDA chart is available free and the Van Wagenen chart costs only a few cents. Other equipment, such as a flat piece of glass and containers for the eggs, you probably have on hand.

In addition to the cost of the equipment there is the cost of the eggs and the labor. One way of minimizing these costs is to find a market for the broken-out eggs. Local bakeries, confectioners, cafeterias, and other institutions have been used as outlets for the eggs. If you use clean containers and equipment, there is no reason why you cannot have a good salable product.

Egg holding conditions. Holding conditions need not be considered in observations on shell thickness or blood and meat spots, but are important when albumen quality is to be measured or scored. All eggs to be tested for albumen quality must be held for the same length of time and at the same temperature before being opened. The actual length of time between laying and testing is not important, but this period must *always* be constant. From a practical standpoint a good plan is to allow eggs to stand overnight in an egg room. Observations should be started at the same time each day.

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